Traffic Stops by the Richmond Police Department: July 1, 2020 – December 6, 2020

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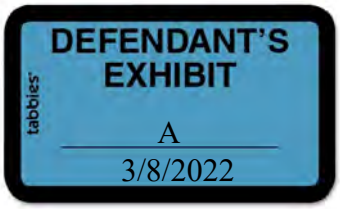
Introduction

Racial bias and racial disparities in the criminal legal system exist at many levels, from sentencing of criminal defendants (Levinson, Bennett, and Hioki, 2017; Rachlinski, Johnson, Wistrich, and Guthrie, 2008), jury decision-making (Sweeny and Haney, 1992), prosecutorial discretion (Smith and Levinson, 2011), to policing (Baumgartner, Christiani, Roach, and Shoub, 2017; Dunn, 2009; Glaser, 2015; Kahn and Martin, 2016). In all of these areas, we find that racial bias plays a role in the decision-making process, resulting in Black people and other racial and ethnic minorities often facing harsher scrutiny or punishment than their White peers. Though each step of the system is an important contributor to the overall disparities that exist within the criminal legal system, many interactions with the criminal legal system begin with routine traffic stops. However, it is not speeding, lack of use of a seatbelt, or another violation that typically results in greater interaction with the criminal legal system, but the fact that officers use these stops to look for evidence of other crime (Baumgartner, Christiani, Roach, and Shoub, 2017; Carroll and Gonzalez, 2014; Makofske, 2020; Richmond Transparency and Accountability Project, 2019). Concern with racial disparities occurring in traffic stops dates back to the war on drugs, in which specific characteristics, including race were used to develop profiles of drug couriers on our nation's highways (Harris, 1999). During the 1990's, stops of Black drivers were so ubiquitous that the term "Driving While Black" or "Driving While Brown" was coined to describe the phenomena (Harris, 1999). Though profiling specifically based on race is not legal, that does not mean that all profiling involving race has been eliminated, nor does it mean that profiling based solely on race does not occur (Fredrickson and Siljander, 2002). In fact, the enduring presence of racial disparities in traffic stops has led many states or jurisdictions, including Virginia, to track demographic data regarding individuals stopped, as well as the outcome of stops and other actions (such as searches) that took place during the stop (Baumgartner, Christiani, Roach, and Shoub, 2017).

Traffic Stops

The first issue to consider in examining racial disparities in police stops is whether Black drivers commit traffic infractions more often than White drivers, as this would make them more likely to be pulled over. However, there is very limited data that would suggest that Black drivers commit more traffic infractions than White drivers (Harris, 1999; Lundman and Kowalski, 2009; Norton, Fung, and Stayton, 2021). Self-report studies of speeding from New York collected over several years, consistently show that Black drivers report speeding less often than White drivers (Norton, Fung, and Stayton, 2021); although there is no reason to expect that drivers in Richmond would differ, the New York study is one of the only ones that speaks to this issue. Lange, Blackman, and Johnson (2001) in their study of speeding on the New Jersey Turnpike suggested that Black drivers were more likely to engage in excessive speeding (more than 15 MPH over the speed limit), however, Lundman and Kowalski's (2009) work showed that both age and gender account for much of that effect. Moreover, excessive speeding was evident in a relatively small



proportion of cases, which would not account for the larger disparities witnessed in traffic stops along the New Jersey Turnpike (Lundman and Kowalski, 2009). Pierson et al. (2020) have suggested that it is not differences in driving behavior, but driver race that is the primary predictor in traffic stops. Pierson's team analyzed the impact of darkness hours on rates of traffic stops, comparing stops during the daytime and the evening. Their analysis demonstrated that racial differences in rates of stops diminished under the "veil of darkness" (Pierson et al, 2020). These studies show minimal evidence of differences in driving behavior between Black and White drivers, but do suggest that racial bias plays a role in stops.

It is also important to consider whether there are differences in the likelihood to be pulled over. Langan (2001) used nationally representative data to examine this question, finding that even though there are proportionally fewer Black drivers than White drivers (that is to say, Black people are less likely to have a driver's license than White people). Black drivers are still stopped more often than White drivers. Additionally, in examining people who were pulled over more than once in the prior year, Black drivers were much more likely to have been pulled over multiple times. The Langan (2001) study is especially important because it utilizes nationally representative data including those who were pulled over, as well as those who were not pulled over, in order to assess differences between racial groups. Most data collected is only once a stop has occurred, telling us less about the entire population of drivers than they type of nationally representative data that Langan utilized.

Reason for Stops

The reason for a stop is another important factor in understanding the complexities behind racial profiling, particularly as it relates to the issue of pretextual stops. (England and Calnon, 2004; Johnson, 2010; Makofske, 2020). Traffic stops can be made for a number of reasons, most often for traffic violations (which can vary greatly in severity). But equipment violations are also violations of the traffic code that can result in a stop. Pretextual stops are those that are not specifically out of regard to concern for public safety, such as having a side marker out on one's vehicle. Pretextual stops have greater latitude in the amount of discretion an officer can use in whether to conduct the stop itself; for example, it would be more difficult for an officer to ignore someone driving dangerously than someone with a minor equipment violation. Likewise, there is a substantial amount of discretion in how they utilize any stop as a means of investigating other potential crime. Though pretextual stops are legal, there is concern among criminologists and legal scholars as to how much they may contribute to racial bias in traffic stops. (England and Calnon, 2004; Johnson, 2010; Makofske, 2020). In one specific example, Makofske (2020) found especially high rates of arrest for "failure to signal" in Louisville, KY, even when failure to signal was the sole reason for the stop. Likewise, Higgins, Vito, and Walsh (2008) discovered an abnormally high number of stops in Louisville for equipment violations, as compared to other jurisdictions, which they suggest were pretextual stops. Thus, equipment violations, particularly as they relate to pretextual stops, may be an important factor in understanding racial disparities in traffic stops.

Searches Conducted During Stops

Once a stop has occurred, it is important to examine whether there are differences in what occurs during the stop itself, based upon the race of the driver. One of the most examined aspects in this regard is searches conducted during the stop. Perhaps the most comprehensive study regarding

searches conducted during traffic stops is Baumgartner, Christiani, Roach, and Shoub's (2017) analysis of 132 jurisdictions' data on traffic stops across multiple years of data, resulting in analysis of over 50 million traffic stops from across the U.S. They found that in most jurisdictions, searches of Black drivers were more common than searches of White drivers. On average, Black drivers were 2.5 times more likely to be searched. Due to the differing nature of data collection across jurisdictions, this figure combines both searches of persons and searches of vehicles (Baumgartner, Christiani, Roach, and Shoub, 2017). However, similar findings regarding Black drivers being searched more frequently than White drivers have been found across multiple smaller studies (Carroll and Gonzalez, 2014; Engel and Calnon, 2004; Ridgeway, 2009).

Outcome of Stops

Ultimately, the outcome of the stop is one of the most important aspects of a traffic stops, as this also determines whether or not there will be continued contact with the criminal legal system as a result of the encounter. Those who are arrested may experience serious impacts to their livelihood due to pretrial detention (Harvey, 2019). Even those who eventually cannot pay the fee for a citation may face serious disruptions to their lives due to later incarceration (Harvey, 2019). When examining national data, Black drivers are more likely to be arrested as the result of a traffic stop than White drivers (Engel and Calnon, 2004). Black drivers nationally are also more likely to be ticketed than White drivers (Engel and Calnon, 2004). Analyses of particular locations, such as Cleveland, OH, Cincinnati, OH, Houston, TX, or New Jersey, reveals similar patterns of higher ticketing and/or arrests of Black drivers (Dunn, 2009; Harris, 1999; Ridgeway, 2009; Roh, and Robinson, 2009). Similarly, in 2019, the Richmond Transparency and Accountability Project released a report analyzing data from the Richmond Police department regarding traffic arrests, showing that in Richmond, Black drivers were more likely to be arrested than White drivers.

Data

The data analyzed was provided by the Richmond Police Department and contains data collected in accordance with Virginia's *Community Policing Act*, which was specifically established to prohibit and monitor "biased-based profiling" in policing in Virginia. "Biased-based profiling" refers to policing that relies solely on a characteristic such as race or gender in making decisions about policing, such as the decision to stop an individual. The data contains all traffic stops conducted from July 1, 2020 through December 6, 2020 by the Richmond Police Department (RPD).

Sample

During the time period analyzed, 2,582 stops occurred. As subsequent analyses required location data, only stops with valid location data were included in the final analysis. 82 of the 2,582 stops (3.18%) included locations outside of RPD's jurisdiction. These had no impact on the overall results, thus, these were omitted from final analyses. Additionally, for chi-square (χ^2) analyses involving race, the small number of stops involving Asian, American Indian, or drivers of

"Unknown" races led to those categories being excluded from analyses leading to a final analytic sample of 2279 for most analyses[1].

Description of Key Variables

Location: Location in the original data was noted as an address, intersection, or block number. The location information was processed by Geocodio to generate latitude and longitude coordinates for each stop. Geocodio also provides accuracy analysis based on the location provided. For all locations with less than a .6 accuracy score, locations were checked and corrected by an intern with the public defender's office. I verified a random selection of these to ensure accuracy in corrected latitude and longitude, and found no discrepancies in the corrections. Only 11 items retained in the final analysis had location scores of less than .6, representing less than 1% of the data. Again, inclusion of these data did not impact the overall analysis.

Race of Driver: Race of driver is a categorical variable with Black (76%), White (15%), Asian (1%), American Indian (<1%), or "Unknown" (8%) as possible response options.

Reason for Stop: The reason for stop is a categorical variable indicating why the initial stop occurred. Most commonly stops were for traffic violations (69%) or equipment violations (36%), though other reasons for stops were noted (5%).

Action Taken as Result of Stop: This variable is a categorical variable representing the most serious action taken as the result of a stop. Resultant outcomes (from most to least serious) include arrest (7%), citation or summons issued (24%), or a warning issued (69%).

Search of Persons: This is a binary variable (yes or no) indicating whether any person was searched as a result of the stop. Searches occurred in 10% of cases.

Search of the Vehicle: This is a binary variable (yes or no) indicating whether the vehicle was searched as a result of the stop. Searches occurred in 14% of cases.

Arrest of Person Other than Driver: This is a binary variable (yes or no) indicating whether an individual other than the driver was arrested as a result of the stop. Arrest of a person other than the driver occurred in 3% of cases.

Analysis

The analyses examine whether there are statistically significant differences in the nature of traffic stops conducted by the Richmond Police Department according to race of the driver of a vehicle. Although regression has been used to examine similar data, those techniques were not appropriate due the distribution of the data in this instance. Specifically, the data contained high levels of multicollinearity (indicating interrelationships among the independent variables), which make the chi-square analysis more appropriate. Thus, a series of chi square (χ^2) tests were utilized to examine the relationship between the race of the driver and several characteristics of

[1] See "Analysis" section for more detail on chi-square test and decisions regarding inclusion/exclusion of data.

the traffic stops. The χ^2 test has several assumptions, such as independence of observations, having mutually exclusive categories for analysis, and perhaps most important to this analysis, a minimum of 5 expected observations in each cell for 80% of the cells is required (McHugh, 2013). Though all other assumptions were met, the minimum expected cell count was violated for variables related to race of the driver, requiring changes to the analytic strategy. Specifically, this led to traffic stops involving Asian, American Indian, and drivers of "Unknown" races being dropped from final χ^2 tests[2]. Dropping these cases did not result in changes to overall significance or changes to the overall pattern of findings for each individual analysis. Additionally, in the analysis of equipment violations and race of the driver, one cell (rather than several) presented a small number of cases, in order to correct for this, a variation of the chi-square test, the Fisher's exact test was used. In order to assess the strength of the association, Cramer's V was computed for significant χ^2 tests with more than four cells (Healey, 2014; McHugh, 2013), while Kendall's Tau was computed for significant χ^2 tests with only four cells (Cliff and Charlin, 1991; Daniels, 1978). Analysis of individual cells contribution to the χ^2 statistic was also performed for all significant findings (Sharpe, 2015). Stata/SE 16.1 was used for these analyses. In examining the results of the chi-square analyses, the χ^2 test indicates that there is a significant relationship between the variables if the associated p-value is less than .05, while the Cramer's V or Kendall's Tau indicates how strong that association is (with larger numbers in terms of absolute value indicating a stronger association).

ArcGIS Pro was used to examine the data in relation to spatial relationships among stops. Specifically, the location data was used to visualize the location of stops across Richmond and to determine the precinct in which individual stops occurred based on geo-location data. Additionally, heat maps were generated to identify the locations in which stops occur more frequently on the basis of clustering of the data (Scott and Janikas, 2010). Maps of the police precincts are provided as an overlay to the map of stops, as well as the most recent (2015-2019) racial demographic data from the American Community Survey.

Findings

Summary data can be found in Table 1. The majority of stops in Richmond during the time period under investigation were of Black drivers (77%). In comparison to White drivers, Black drivers were 5.13 times more likely to be stopped. The majority of stops involved traffic

[2] For example, in examining the outcome of stops (arrest, citation/summons, or warning) by race of the driver (American Indian, Asian, Black, White, and "Unknown") each outcome by race category produces a cell to be used in the analysis for a total of 15 cells. The counts for many of these cells was less than five; only 2 Asian drivers were arrested and none of the cells (arrest, summons/citation, or warning) contained 5 cases for Native American drivers. While a chi-square statistic can be computed with low cell counts, it can lead to inaccurate p-values (measures of statistical significance); likewise, use of data with low cell counts could lead to inaccurate estimation of the strength of an association. To ensure that the p-values were accurate and that strength of association was appropriately assessed, only Black and White drivers were included in the final analyses presented in this report. To ensure this did not impact the overall findings, chi-square tests were also run including all racial groups for each test presented and the significance did not change for any of the analyses; thus the findings are robust with regard to inclusion or omission of the additional racial groups.

violations (69%), with equipment violations also comprising a large portion of stops conducted (36%). Additionally, most stops resulted in a warning being issued (69%). However, in the 7% of cases in which arrest of the driver occurred, Black drivers were 12.67 times more likely than White drivers to be arrested as the result of a stop. During most stops, additional actions were not taken, such as searches of persons, searches of the vehicle, or arrest of individuals other than the driver; these occurred only in a minority of cases.

Table 1. Summary Data

Variable		Frequency	Percent
Race of Driver			
	American Indian	2	0.08
	Asian	19	0.76
	Black	1925	77
	White	354	14.16
	Unknown	200	8
Outcome of Stop			
	Arrest	179	7.17
	Citation/Summons	560	22.44
	Warning	1756	70.38
Reason Stopped			
	Traffic Violation	1426	58.48
	Equipment Violation	910	36.4
	Other	128	0.05
Search of Person			
	Yes	266	10.65
	No	2232	89.35
Search of Vehicle			
	Yes	367	14.68
	No	2133	85.32
Arrest of Person Other than Driver			
	Yes	86	3.82
	No	2165	96.18

The primary analysis was to conduct a chi-square test of independence on the traffic stop data regarding the race of the driver and primary result of the stop (arrest, summons/citation, or warning). Based on the Chi-square test, there are significant differences in the result of a stop based on driver race (χ^2 (2, N=2276) = 33.19, $p < .01$) the results of this analyses are presented in Table 2. Cramer's V = .12, indicating that there is a weak to moderate, but substantive effect of race of driver on the result of a stop. In examining individual cells, Black drivers faced the most severe outcome, arrest, more often than expected by chance; while White drivers

experienced arrest less often than expected by chance. This pattern was reversed for summons/citations; with White drivers receiving summons more often than expected by chance and Black drivers less often than expected by chance. The overall contribution to the analysis of receiving a warning based upon race was minimal.

Table 2. Chi-Square Tests of Association on Race of Driver and Result of Traffic Stop

	Outcome of Stop			Total
Race of Driver	Arrest	Summons/Citation	Warning	
Black	152	390	1380	1922
	{7.91}	{20.29}	{71.80}	{100}
White	12	117	225	354
	{3.39}	{33.05}	{63.56}	{100}
Total	164	507	1605	
	{7.21}	{22.28}	{70.52}	
Chi-square (2, N=2276) = 33.19, p < .01				
Cramer's V = .12				

Note: Counts are provided with row percentages in {}

Additional chi-square tests of independence on the traffic stop data regarding the race of the driver and other actions taken during the stop were conducted; specifically, whether a person was searched during the stop, whether the vehicle was searched during the stop, or whether a person other than the driver was arrested as the result of a stop. Based on these Chi-square tests, there are significant differences in searches conducted during a stop based on driver race, but not in arrests of additional persons. The results of each of these analyses are presented individually.

In regard to a person being searched during the stop, the results were statistically significant (χ^2 (1, N= 2277)= 6.25, p = .01). The results of this analyses are presented in Table 3. Kendall's Tau was used to measure strength of association, with τ = -0.05, indicating that there is a weak effect of race of driver on searches of persons performed during a stop. In examining individual cells, Black drivers were searched more often than expected by chance; while White drivers were searched less often than expected by chance.

In regard to the vehicle being searched during the stop, the results were statistically significant (χ^2(1, N=2279) = 20.73, p < .01) the results of this analyses are also presented in Table 3. Kendall's Tau was used to measure strength of association, with τ = -0.10, indicating that there is a weak effect of race of driver on searches of the vehicle performed during a stop. In examining individual cells, the vehicles of Black drivers were searched more often than expected by chance; while the vehicles of White drivers were searched less often than expected by chance.

The results of the analysis regarding the arrest of additional persons based on the race of the driver were not significant (χ^2 = 0.17, p = .68).

Table 3. Chi-Square Tests of Association on Race of Driver and Searches of Vehicles and Persons

	Search of Person			Search of Vehicle		
Race of Driver	Yes	No	Total	Yes	No	Total
Black	223	1701	1924	317	1608	1925
	{11.59}	{88.41}	{100}	{16.47}	{83.53}	{100}
White	25	328	353	25	329	354
	{7.08}	{92.92}	{100)	{7.06}	{92.94}	{100)
Total	248	2029		342	1937	
	{10.89}	{89.11}		{15.01}	{84.99}	
	Chi-square (1, N=2277) = 6.25, p = .01			Chi-square (1, N=2279) = 20.74, p < .01		
	Kendall's Tau = -0.05			Kendall's Tau = -0.10		

Note: Counts are provided with row percentages in {}

Additional analyses were conducted to determine whether the reason for the stop (equipment violation or traffic violation) had an impact on the outcome of the stop. The results of the analysis regarding differences in outcomes for stops involving traffic violations based on the race of the driver was significant ($\chi^2(2, N=1323) = 14.07$, $p < .01$). Cramer's V was used to measure strength of association, with V = .10, indicating that there is a weak effect of race of driver on the outcome of stops for traffic violations. In examining individual cells, White drivers were given a summons or citation more often than expected by chance; while Black drivers received a summons or citation less often than expected by chance. In regard to differences in outcomes for stops involving equipment violations based on the race of the driver, the test was statistically significant ($\chi^2(2, N=848) = 7.24$, $p = .02$). Cramer's V was used to measure strength of association, with V = 0.09, indicating that there is a weak effect of race of driver on the outcome of a stop for equipment violations. Similar to traffic stops, White drivers were given a summons or citation more often than expected by chance; while Black drivers received a summons or citation less often than expected by chance. However, Black drivers were more likely than chance to be arrested as the result of a stop for an equipment violation. The results of these analyses can be found in Table 4.

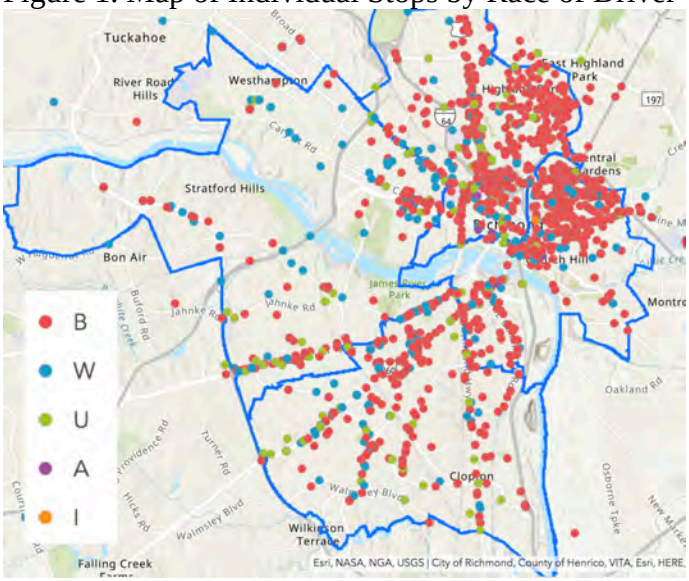
Table 4. Chi-Square Tests of Association on Race of Driver and Result of Traffic Stop for Traffic Violations and Equipment Violations

	Outcome of Stop (Traffic Violations)				Outcome of Stop (Equipment Violations)			
Race of Driver	Arrest	Summons/Citation	Warning	Total	Arrest	Summons/Citation	Warning	Total
Black	62	318	698	1078	56	62	632	750
	{5.75}	{29.50}	{64.75}	{100}	{7.47}	{8.27}	{84.27}	{100}
White	9	102	134	245	2	14	82	98
	{3.67}	{41.63}	{54.69}	{100)	{2.04}	{14.29}	{83.67}	{100)
Total	71	420	832		58	76	714	
	{5.37}	{31.75}	{62.89}		{6.84}	{8.96}	{84.20}	
	Chi-square (2, N=1323) = 14.07, p < .01				Chi-square (2, N=848) = 7.24, p = .02			
	Cramer's V = .10				Cramer's V = .09			

Note: Counts are provided with row percentages in {}

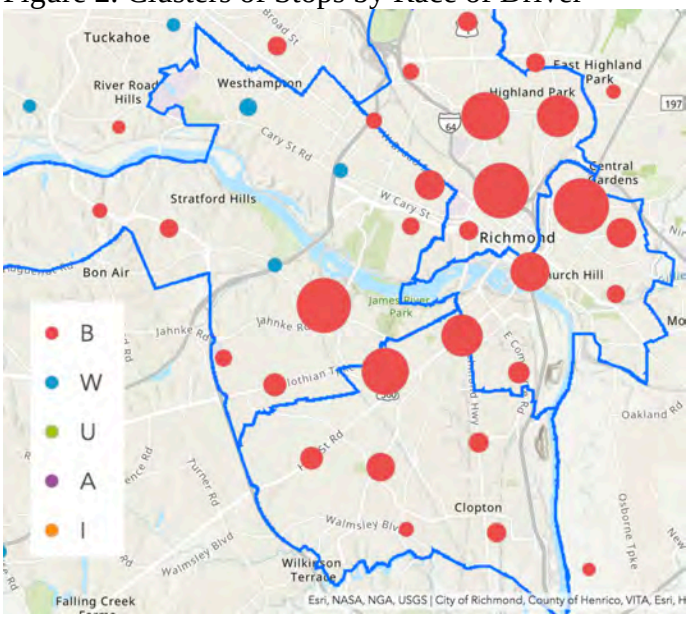
In regard to the spatial analysis, the map of the individual stops that occurred during the time period under investigation by the Richmond police department is presented in Figure 1, with each dot indicating an individual stop.

Figure 1. Map of Individual Stops by Race of Driver



First, stops were clustered by race to generate an overall picture of the geographic distribution of stops by race of driver, with each cluster representing 5 or more stops in geographic proximity to one another. As the majority of stops by the Richmond police department are of Black drivers, most clusters are also of Black drivers, while White drivers are distributed throughout the city and less likely to show as clusters. This can be seen in Figure 2. Note- this data does include drivers of all races, however, clustering only appears for Black and White drivers due to the small number of stops of other racial groups.

Figure 2. Clusters of Stops by Race of Driver



Next, a heat map was produced for both Black drivers (Figure 3) and White drivers (Figure 4). Heat maps display the density of stops for each group. Based on comparison of these two maps,

there are a greater number of high density locations for stops of Black drivers in comparison to White drivers.

Figure 3. Heat Map of Traffic Stops of Black Drivers

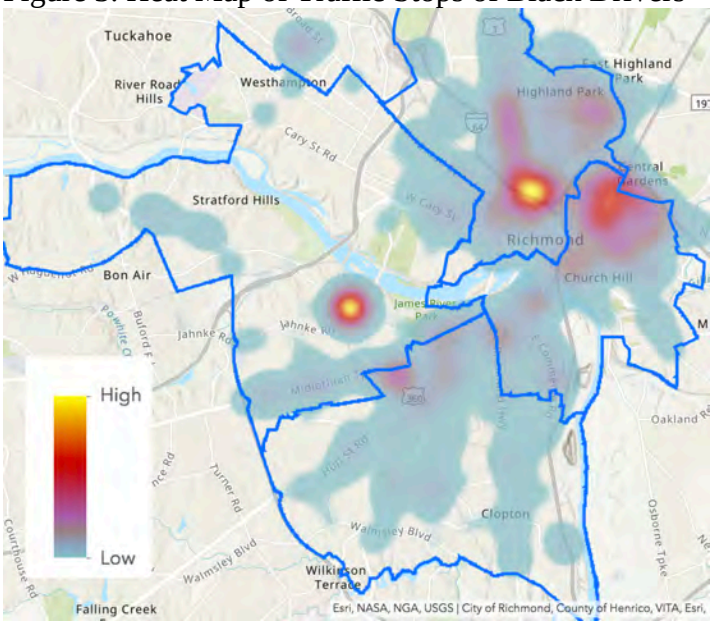
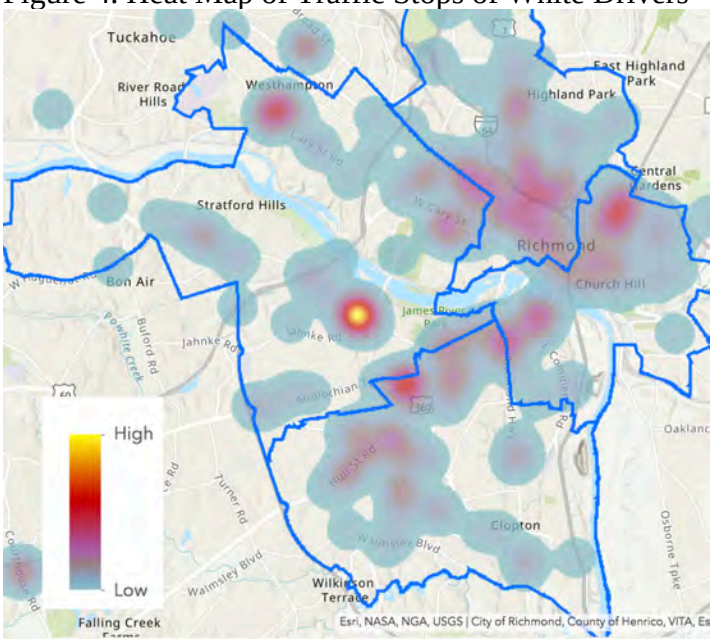


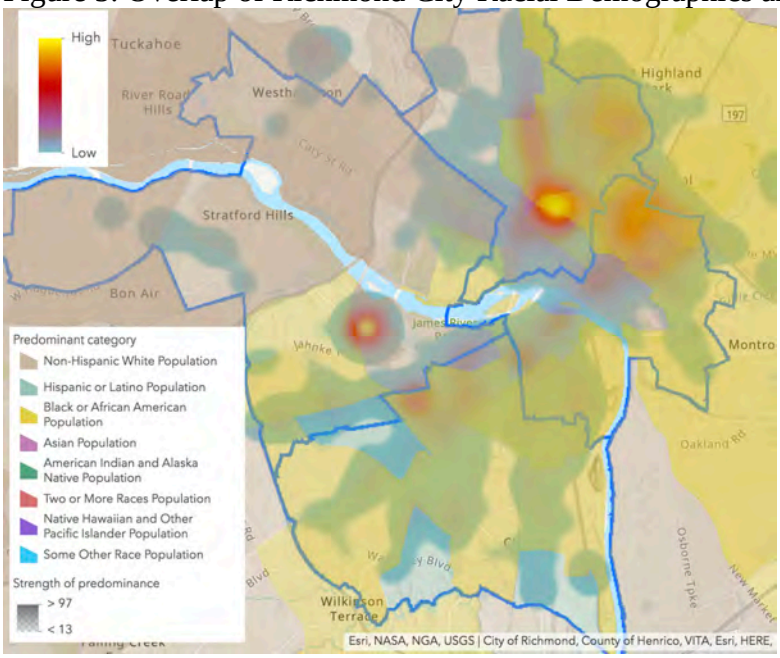
Figure 4. Heat Map of Traffic Stops of White Drivers



Finally, the heat map of stops of Black drivers is presented as an overlay onto the most recent (2015-2019) racial demographics from the American Community Survey, which maps the most prevalent racial demographic living in an area. When examining this map, we see that there are several areas of high density traffic stops of Black drivers in predominantly White areas of Richmond, as well as numerous areas of high density stops of Black Drivers along areas in areas

where racial demographics are in transition, specifically those areas in which predominantly White and predominantly Black neighborhoods border one another.

Figure 5. Overlap of Richmond City Racial Demographics and Traffic Stops of Black Drivers



Conclusion

The statistical significance of these findings across multiple analyses highlights how pervasive the racial disparities in police stops by the Richmond Police Department are. Throughout almost every step of a traffic stop, from the likelihood that a driver is pulled over, to the actions taken during the stop, to the eventual outcome of that stop, Black drivers are at a significant disadvantage compared to White drivers. Though the effect is somewhat weak, this is still an important substantive effect. Race should have no bearing on whether an individual is stopped, whether they are searched, or whether they are arrested during a traffic stop. But in each of these analyses, there is a significant but weak effect. The cumulative impact of these weak effects is that Black drivers face substantially different outcomes as the result of traffic stops as compared to White drivers. This is perhaps most evident when looking at differences in stops for equipment violations for Black and White drivers; while only 2% of White drivers are arrested after being pulled over for an equipment violation, roughly 7.5% of Black drivers are. Given that stops for equipment violations are often considered pretextual stops with greater potential for discretion and bias to impact the incident, these arrests are of particular concern; however, lack of additional data doesn't allow for investigation of these incidents in more detail in this report.

The spatial analyses of the data suggest are also striking. When stops are clustered, it becomes clear that almost all concentrations of stops are of Black drivers. We also see that these clusters are distributed throughout the city, and not contained within predominantly Black neighborhoods. In looking at the clusters of White drivers, the few clusters that exist only occur in neighborhoods that are predominantly White to begin with. This indicates that Black drivers are pulled over in areas where they are both the majority and the minority. The heat map of stops of Black drivers paired with the racial demographic overlay also suggests that enforcement of

traffic stops occurs along lines of gentrification, where predominant racial groups may be in transition and racial boundaries may be especially salient. Along both racial boundaries and in primarily White areas, who does and does not belong may be more noticeable, thus implicating race as a factor in traffic stops specifically in those areas.

While this report cannot say whether a specific traffic stop was the result of racial bias or racial profiling, this report does conclude that race is a significant factor in the decision to stop a driver, whether a person or vehicle is searched, the outcome of a stop, and the location where stops occur.

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